K-1436P Cont
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of: Mehrotra et al.	)	
Continuation of	)	GROUP ART UNIT ____
Serial No. 09/576,833, filed May 22, 2000	)	
Filed: June 26, 2003	)	Examiner: _____
For: PROCESS FOR HEAT TREATING	)	
CERAMICS AND ARTICLES OF	)	
MANUFACTURE MADE THEREBY	)	

ASSISTANT COMMISIONER FOR PATENTS
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Date: June 26, 2003

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Stephen T. Belsheim
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Sir:

PRELIMINARY AMENDMENT

Prior to the Examination of the above-referenced patent application, applicants request that this amendment be entered.

Please amend the application as follows:

IN THE CLAIMS

Please cancel claims 42, 44, 45, 46, and 47.

Please amend claims 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 43, 50, 51, 53 and 54 to read as follows:

In the application of: Mehrotra et al.
Continuation of
Serial No. 09/576,833, filed May 22, 2000)
Filed: March 28, 2003
PRELIMINARY AMENDMENT

25. (First Amended) A heat treated ground ceramic cutting insert produced by the process comprising the steps of:

providing an uncoated ground ceramic cutting insert having at least a portion thereof being ground; and

heat treating the ground ceramic cutting insert at a temperature between about 1300 degrees Centigrade and about 2200 degrees Centigrade so as to form the heat treated ground ceramic cutting insert.

27. (First Amended) The cutting insert according to claim 25 wherein the process further includes the steps of:

forming a green ceramic cutting insert compact from a powder mixture;

sintering the green ceramic cutting insert compact so as to form a sintered unground ceramic cutting insert compact;

hot isostatically pressing the sintered unground ceramic cutting insert compact so as to form an uncoated unground ceramic cutting insert blank; and

grinding at least a portion of the uncoated unground ceramic cutting insert blank so as to form the uncoated ground ceramic cutting insert.

28. (First Amended) The cutting insert according to claim 25 wherein the process further includes the steps of:

forming a green ceramic cutting insert compact from a powder mixture;

sintering the green ceramic cutting insert compact so as to form a sintered unground ceramic cutting insert compact; and

grinding at least a portion of the uncoated unground ceramic cutting insert blank so as to form the uncoated ground ceramic cutting insert.

29. (First Amended) The cutting insert according to claim 27 wherein the powder mixture comprises about 14.2 weight percent zirconia; about 2.3 weight percent $MgAl_2O_4$; about 1.2 weight percent silicon carbide whiskers; about 0.14 weight percent silicon dioxide; about 0.02 weight percent calcium oxide; and the balance alumina.

30. (First Amended) The cutting insert according to claim 25 wherein the powder mixture comprises between about 60 weight percent and about 98 weight percent silicon nitride, up to about 12 weight percent aluminum nitride, up to about 25 weight percent alumina, up to about 2 weight percent magnesia, and up to about 7 weight percent yttria.

31. (First Amended) The cutting insert according to claim 25 wherein the process further includes the steps of:

forming a green ceramic cutting insert compact from a powder mixture;

uniaxially hot pressing the green ceramic cutting insert compact so as to form a hot pressed unground ceramic cutting insert compact; and

grinding at least a portion of the hot pressed unground ceramic cutting insert compact so as to form the uncoated ground ceramic cutting insert.

32. (First Amended) The cutting insert according to claim 31 wherein the powder mixture comprises alumina and silicon carbide whiskers.

33. (First Amended) The cutting insert according to claim 32 wherein the powder mixture further includes zirconia.

34. (First Amended) The cutting insert according to claim 32 wherein the powder mixture further includes titanium carbonitride.

35. (First Amended) A heat treated ground ceramic cutting insert formed in the presence of a reaction source, the cutting insert comprising:

a substrate having a surface which defines a rake face and a flank face wherein there is a cutting edge at the intersection of the rake face and the flank face;

the substrate presenting a microstructure wherein there being a surface region extending inwardly from the surface of the substrate, and there being a bulk region inwardly of the surface region;

the bulk region having a bulk composition; and

the surface region having a surface composition resulting from a reaction at a temperature between about 1300 degrees Centigrade and about 2200 degrees Centigrade with the reaction source wherein the surface composition being different from the composition of the bulk region.

36. (First Amended) The cutting insert of claim 35 wherein the surface composition has a content of a selected element that is higher than the content of selected element in the bulk composition.

37. (First Amended) The cutting insert of claim 35 wherein the surface composition has a content of a selected element that is lower than the content of selected element in the bulk composition.

38. (First Amended) The cutting insert of claim 35 wherein the surface region has a first microstructure and a first hardness; and the bulk region having a second microstructure and a second hardness; the first microstructure of the surface region being different from the second microstructure of the bulk region; and the first hardness of the surface region being greater than the second hardness of the bulk region.

40. (First Amended) The cutting insert according to claim 35 wherein the surface region has a first fracture resistance and the bulk region [having] <u>has</u> a second fracture resistance; and the first fracture resistance of the surface region [being] <u>is</u> greater than the second fracture resistance of the bulk region.

41. (First Amended) The cutting insert according to claim 35 wherein the surface region has a first wear resistance and the bulk region [having] has a second wear resistance; and the first wear resistance of the surface region [being] is greater than the second wear resistance of the bulk region.

43. (First Amended) The cutting insert according to claim 35 wherein the surface region has an aluminum content higher than an aluminum content of the bulk region.

50. (First Amended) A heat treated ground ceramic cutting insert formed in the presence of a reaction source, the cutting insert comprising:

a substrate having a surface which defines a rake face and a flank face wherein there is a cutting edge at the intersection of the rake face and the flank face;

the substrate presenting a microstructure wherein there being a surface region extending inwardly from the surface of the substrate, and there being a bulk region inwardly of the surface region;

the bulk region having a bulk microstructure comprising beta silicon nitride phase; and

the surface region having a surface microstructure resulting from a reaction at a temperature between about 1300 degrees Centigrade and about 2200 degrees Centigrade with the reaction source wherein the surface microstructure comprising β' sialon phase, or α' plus β' sialon phase.

51. (First Amended) A heat treated ground ceramic cutting insert formed in the presence of a reaction source, the cutting insert comprising:

a substrate having a surface which defines a rake face and a flank face wherein there is a cutting edge at the intersection of the rake face and the flank face;

the substrate presenting a microstructure wherein there being a surface region extending inwardly from the surface of the substrate, and there being a bulk region inwardly of the surface region;

the bulk region having a bulk microstructure comprising β' sialon phase; and

the surface region having a surface microstructure resulting from a reaction at a temperature between about 1300 degrees Centigrade and about 2200 degrees Centigrade with the reaction source wherein the surface microstructure comprising β' sialon and α' sialon.

53. (First Amended) A heat treated ground ceramic cutting insert formed in the presence of a reaction source, the cutting insert comprising:

a substrate having a surface which defines a rake face and a flank face wherein there is a cutting edge at the intersection of the rake face and flank face;

the substrate presenting a microstructure wherein there being a surface region extending inwardly from the surface of the substrate and there being a bulk region inwardly of the surface region; and

wherein the surface region comprises one or more phases formed during heating at a temperature between about 1300 degrees Centigrade and about 2200 degrees Centigrade in the presence of the reaction source, and wherein the one or more phases include a reaction product of the reaction source, and the reaction source including one or more of the following or their reaction products: the oxides of aluminum, hafnium, zirconium, yttrium, magnesium, calcium and the metals of the lanthanide series of the periodic table; and nitrides and/or carbides of silicon, titanium, hafnium, aluminum, zirconium, boron, niobium and carbon.

54. (First Amended) The heat treated ground cutting inserts of claim 53 wherein at least one of said one or more phases includes titanium nitride.